ATS 715 (2 Credits)
Atmospheric Oxidation Processes
Spring 2018
Instructor: Jeff Collett
Room 116 Atmospheric Science
491-8697
collett@colostate.edu
Office Hours: By Arrangement

Objectives:

1. Develop an understanding of kinetic and equilibrium aspects of important chemical pathways in the troposphere.

2. Examine detailed mechanisms that account for the reactions of volatile organic compounds and nitrogen oxides in the atmosphere and resultant oxidant formation.

3. Examine the molecular composition and formation of organic aerosol particles.

4. Examine aqueous phase oxidation and photochemistry.

Text:

Atmospheric Reaction Chemistry, by H. Akimoto, Springer, 2014. Available via free download from CSU Libraries: https://lib.colostate.edu/ Reading assignments correspond to page numbers in .pdf version.

Atmospheric Chemistry and Physics: From Air Pollution to Climate Change, 3rd Ed., by J.N. Seinfeld and S.N. Pandis, Wiley, 2016. Available via free download from CSU Libraries: https://lib.colostate.edu/ Reading assignments correspond to page numbers in .pdf version.

Optional: *Chemistry of the Upper and Lower Atmosphere: Theory, Experiments and Applications*, by Finlayson-Pitts and Pitts, Academic Press, 2000. This is a great text used in this class in years past, but is now 18 years old. Some parts are still quite good, but some sections are out of date. Optional reading assignments in this text are provided where relevant.

Supplemental readings will be assigned from relevant journals.

Course Structure and Grading Criteria:

The course is offered for two credits. The class is conducted in a lecture/discussion format and is scheduled to meet at 10:00 Tuesdays and Thursdays.

An oral final exam will be given. This exam will cover material from lectures.

Each student will be expected to co-lead one-hour discussions of two research articles. Active participation in discussions of other articles is also expected.

Preparation for class (especially reading) and participation in class discussions are important components of the course.

Grades will be weighted as follows:	Class Participation:	20%
	Oral Exam:	40%
	Article Discussions:	40%

Statement on Academic Integrity:

This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf) and the Student Conduct Code (http://www.conflictresolution.colostate.edu/conduct-code). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

Contact Hours:

2 (At least 2 hours of effort are expected to complete reading and homework assignments outside of class for each hour of class time).

ATS 715 - Atmospheric Oxidation Processes Spring 2018 Schedule

Date	Lecture Topic	Reading Aki = Akimoto SP = Seinfeld and Pandis optFP = Finlayson-Pitts (optional reading)
Jan. 16, 17	Thermodynamics and reaction kinetics	Aki pp. 23-34; SP pp. 69-77; (optFP pp. 130-150)
Jan. 22, 24	Photochemistry (Light absorption and fates of excited molecules)	Aki pp. 11-23 and 47-67; (optFP pp. 43-83)
Jan. 29, 31	Photochemistry cont'd. (Photolyzing tropospheric species)	Aki pp. 71-114; (optFP pp. 86-111)
Feb. 5	Photochemistry (Radical generation)	SP pp. 175-181 and 203-208; (optFP pp. 179-181)
Feb. 7, 12, 14	Hydrocarbon oxidation mechanisms	SP pp. 181-192 and 213-233; (optFP pp. 181-225)
Feb. 19	Article Discussion #1	Kwok and Atkinson (1995) Estimation of hydroxyl radical reaction rate constants for gas-phase organic compounds using a structure-reactivity relationship: an update, *Atmos Env.* **29**, 1685-1695.
Feb. 21	Inorganic nitrogen chemistry	SP 192-208 and 244-246; (optFP pp. 265-286)
Feb. 26	Article discussion #2	Brown et al. (2004), Nighttime removal of NO_x in the summer marine boundary layer, *Geophys. Res. Lett.* **31**, L07108, doi:10.1029/2004GL019412.
Feb 28	PAN (guest lecture by Emily Fischer)	TBD (Lecture time to be rescheduled)
March 5	Biogenic hydrocarbons	SP pp. 233-244
March 7, 19	Ozone formation and control	FP pp. 882-918; Cooper et al. (2016) Challenges of a lowered U.S. ozone standard, *Science* **348** (6239), 1096-1097, DOI: 10.1126/science.aaa5748
March 13, 15 - No Class; Spring Break		
March 21	Article Discussion #3	Hidy & Blanchard (2015) Precursor reductions and ground-level ozone in the Continental United States, J. Air & Waste Mgmt. Assoc., 65:10, 1261-1282, DOI: 10.1080/10962247.2015.1079564
March 26	Article discussion #4	Zhang et al. (2017) Source apportionment of biogenic contributions to ozone formation over the United States, Atmos Env. **164**, 8-19, https://doi.org/10.1016/j.atmosenv.2017.05.044.
March 28, April 2, 4, 9	Organic aerosols	SP pp. 573-615
April 11	Article discussion #5	Worton et al. (2013) Observational insights into aerosol formation from isoprene. *Environ. Sci. Technol.* **47**, 11403−11413, dx.doi.org/10.1021/es4011064
April 16, 18	Aqueous phase chemistry	SP pp. 264-277 and 286-295 and 308-313
Apr 23, 25	Aqueous phase photochemistry	TBD
April 30	Article discussion #6	Tan et al. (2012) or Marais et al. (2016)
May 1-4	Schedule individual oral exam during this period	